

Programming Languages: Energy Consumption and Role in Green Computing

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Recap of Important Background Theory

“Compiled” vs. “Interpreted” Programming Languages

Compiled languages (inherently faster)

Translates source code to machine code before run-time



Interpreted languages (inherently slower)

Translates source code to machine code during run-time



Context/Problem: Increasing energy consumption in Data Centers (big data processing and data mining)

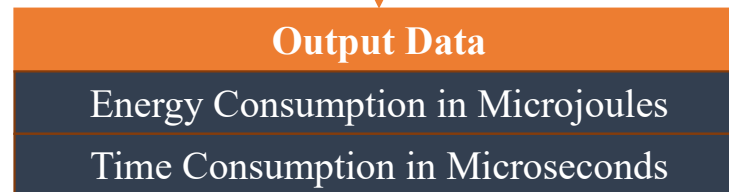
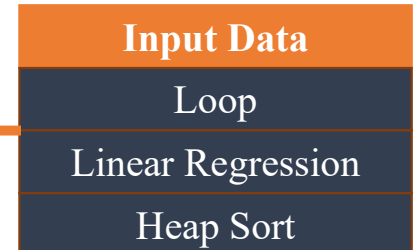
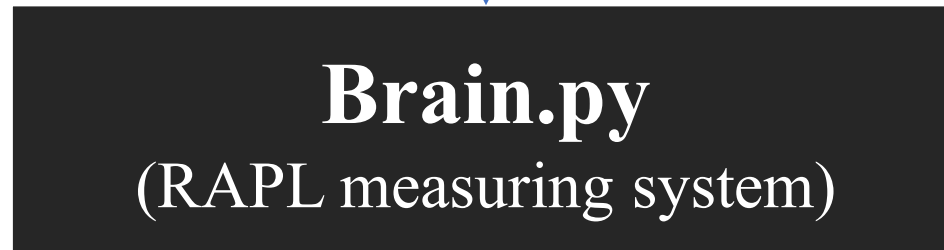
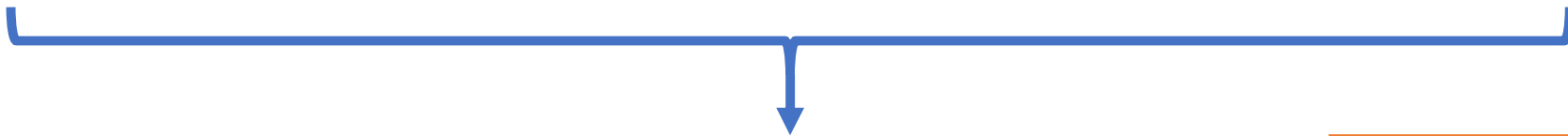
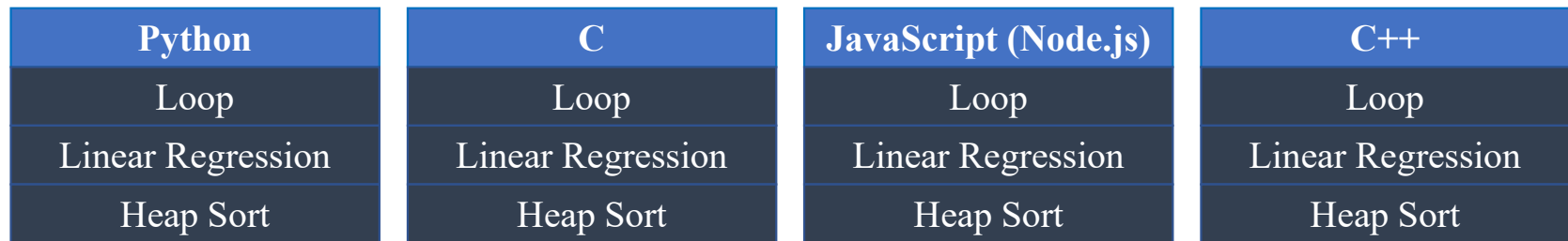
Current Solution: Writing sustainable software (Green coding: optimizing algorithms)

Aim: To compare the energy consumption between programming languages and determine whether the choice of programming language has a significance in improving energy efficiency when performing large computations.

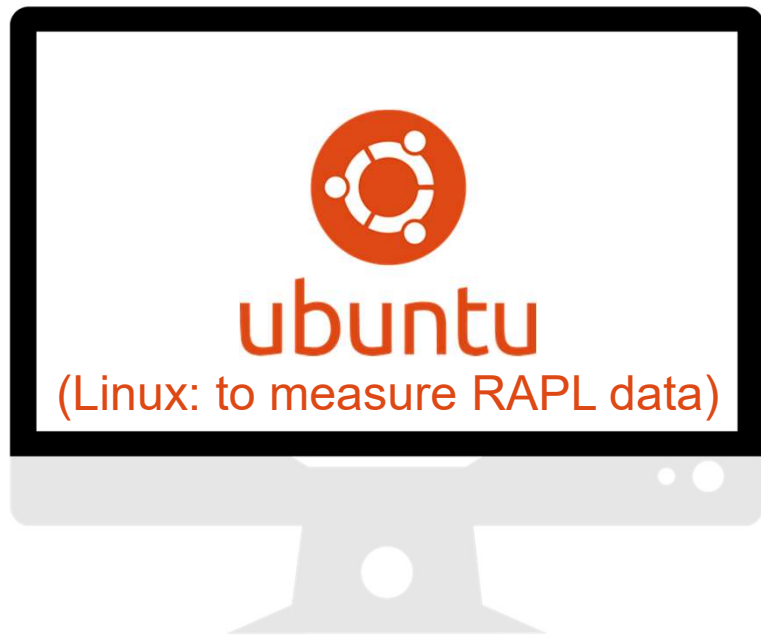
RQ1: How does the energy consumption of processing differ across different programming languages when performing the same set of tasks?

RQ2: Is the faster programming language always the most energy efficient?

RQ3: How can the choice of programming language lower the environmental impact of big data processing and data mining?



Method: Set up of testing environment

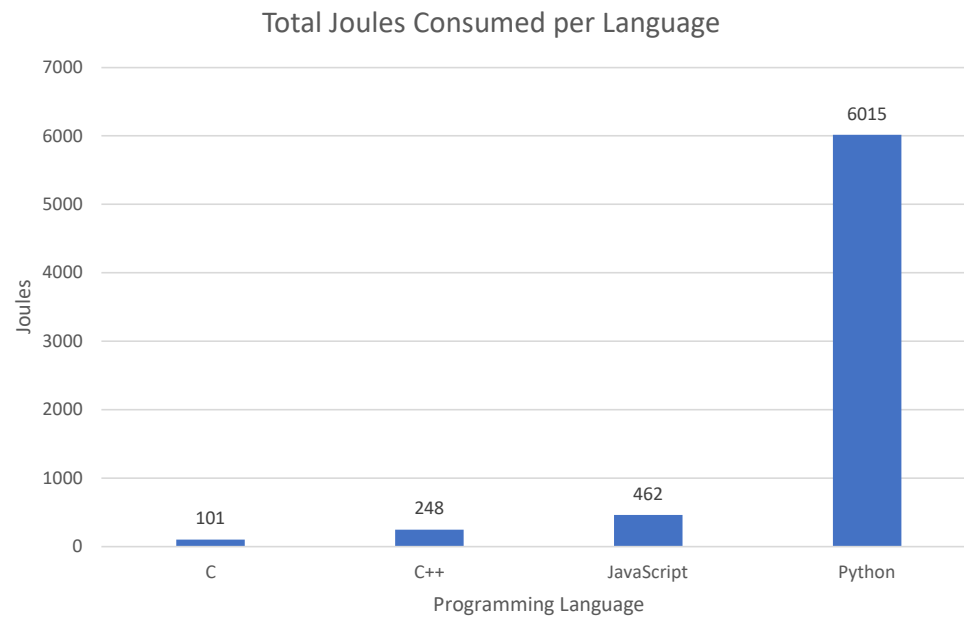


Compiled



Interpreted

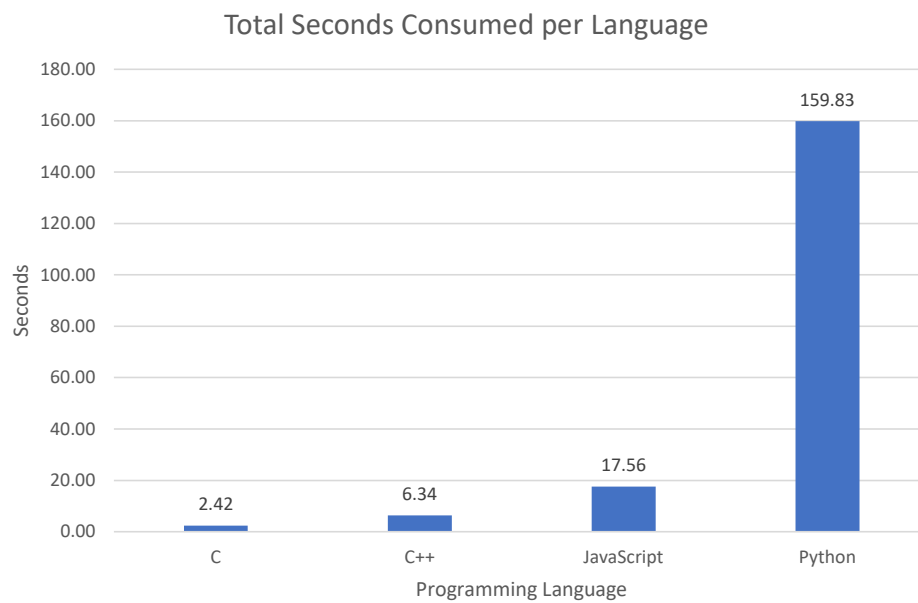




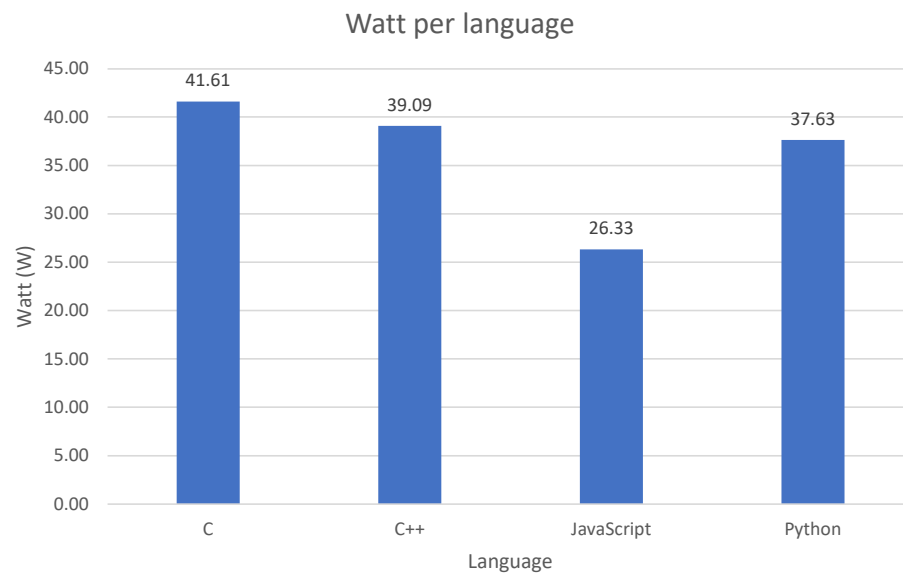
Least to most:

1. C
2. C++
3. JavaScript
4. Python

RQ1: How does the energy consumption of processing differ across different programming languages when performing the same set of tasks?

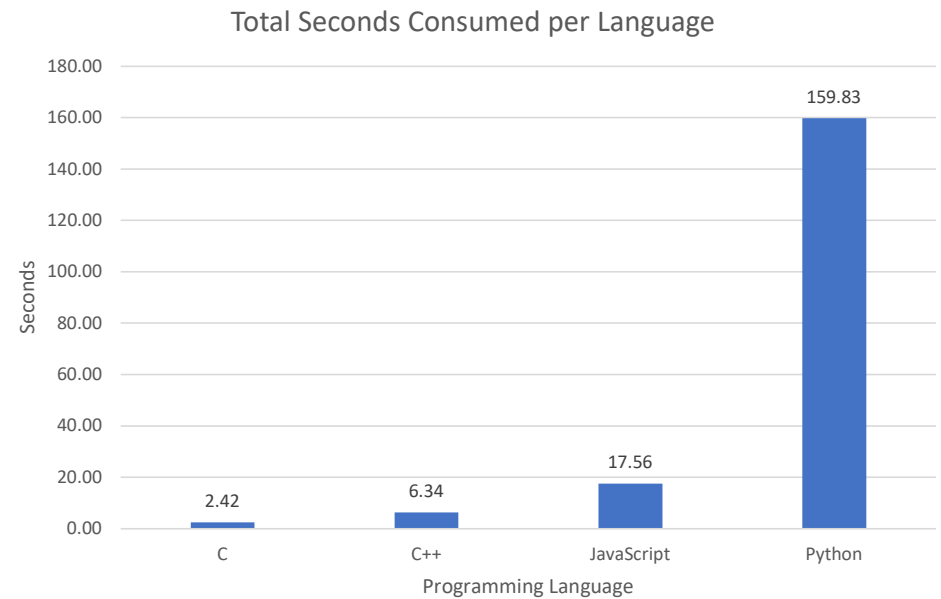
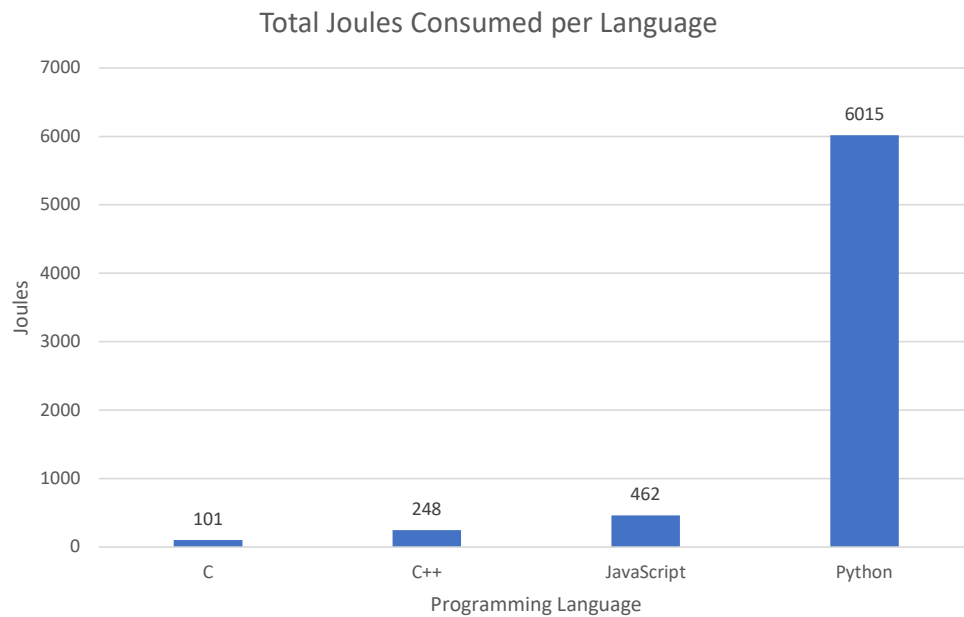


1. C
2. C++
3. JavaScript
4. Python



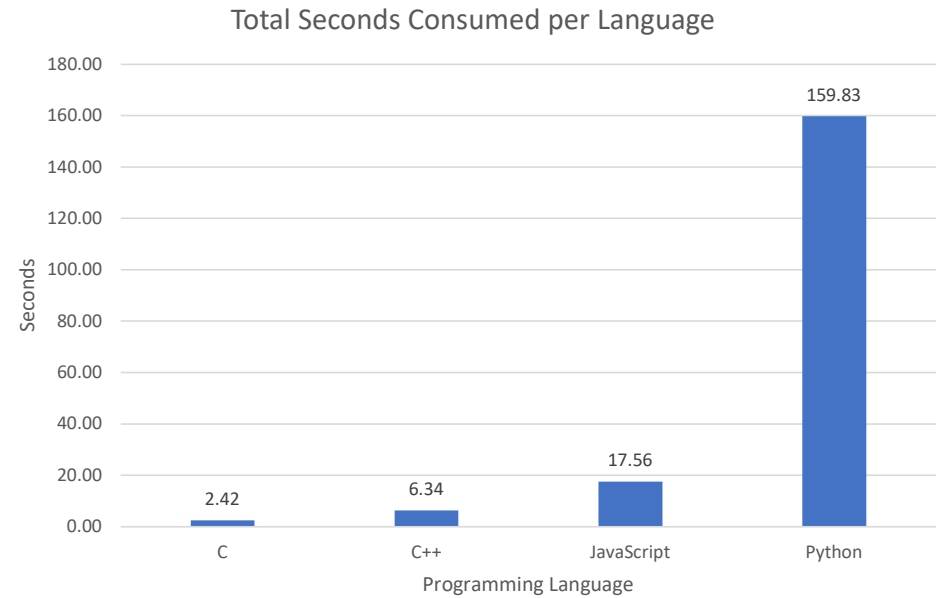
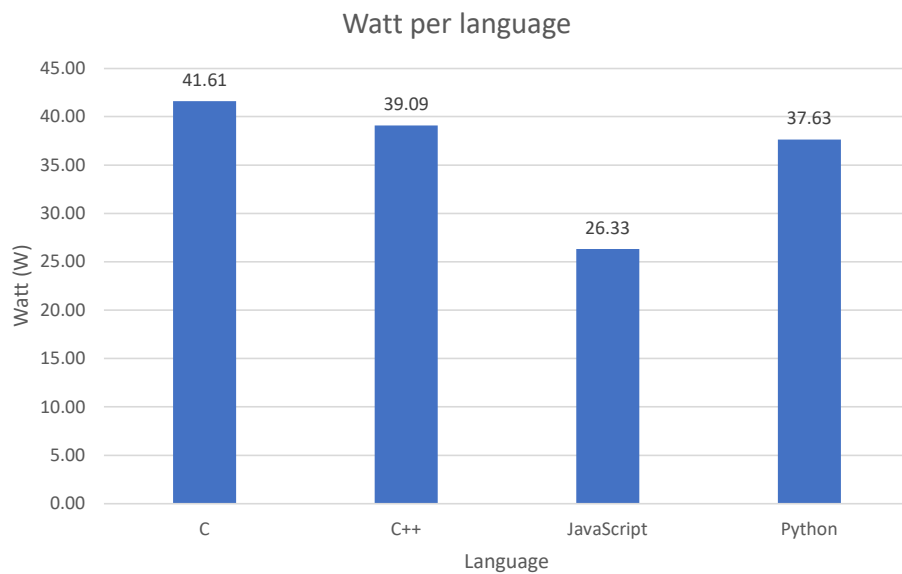
1. JavaScript
2. Python
3. C++
4. C

RQ2: Is the faster programming language always the most energy efficient?



It was observed that out of the programming languages tested, the faster the language, the more energy efficient it was in terms of energy consumption. Faster language = less time and energy consumed

RQ2: Is the faster programming language always the most energy efficient?



Energy efficiency in terms of the rate of energy consumption
(watts)

RQ3: How can the choice of programming language lower the environmental impact of big data processing and data mining?

Computational

Due to the sheer size of modern data processing operations, optimizing energy efficiency in all major processing operations by using energy efficient programming language where applicable, would have a noticeably impact on the global energy usage.

Around the clock operations (24/7)

In the settings where wattage may be limited, such as when powered by a renewable energy source, JavaScript was found to be the most energy-efficient programming language in terms of watts. This means that it can support more constant operations to be ran simultaneously, such as running 24/7, where time consumption may not be a priority.

7.3 (By 2030, double the global rate of improvement in energy efficiency),

13, “take urgent action to combat climate change and its impacts”